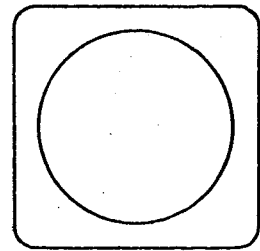


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November 17, 1972

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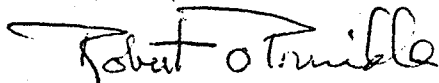
ERTS Contracting Officer
Code 245, GSFC
Greenbelt, Maryland 20771

Dear Sir:

Our first Type II Progress Report under our ERTS-A
project, "Mineral Exploration Potential of ERTS-A Data,"
P-208, is enclosed.

Our ERTS data for this project were received for our
test site on the 27th, 30th and 31st of October and the
1st and 3rd of November, 1972. A preliminary analysis of
this imagery and other corollary data are discussed in
the enclosed report.

Sincerely,

for 
William A. Brewer
Engineering Consultant

Encl.

cc: J. Everett

(E72-10218) MINERAL EXPLORATION POTENTIAL
OF ERTS-1 DATA Progress Report, May - Oct.
1972 W.A. Brewer, et al (Earth Satellite
Corp., Berkeley, Calif.) 17 Nov. 1972 7 p

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16. Abstract Preliminary analysis of a mosaic composing 8 individual ERTS frames (1:1,000,000) extending well beyond the test site has revealed a number of tectonic structural trends that are controlled by regional lineations. So far most of the regional lineations fall into three general directions: east by northeast, northwest and north-south. Although not enough imagery has been examined at this point in time, it seems that the older Precambrian basement predominates in the NE-bearing structural trends, whereas the predominate NW trend is most likely associated with the Texas Structural Zone and the north-south trend being the Utah-Arizona belt and/or part of the southern Basin and Range Province. Comparison to a similar analysis performed on an aeromagnetic contour map of the same scale has indicated that the same structural trends observed on the ERTS imagery are verified and substantiated in the aeromagnetics. One major lineation, made up of many parallel lineations, is noticeable just north of Lake Pleasant which extends for approximately 100 mi. in a northern direction (N80°W) out of the target area. This feature corresponds to a Precambrian schist formation shown on the USGS geologic map of Arizona.			
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MINERAL EXPLORATION POTENTIAL OF ERTS-1 DATA

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Earth Satellite Corporation
2150 Shattuck Avenue
Berkeley, California 94704

November 17, 1972

Type II Progress Report for Period May - October 1972

Prepared for

Goddard Space Flight Center
Greenbelt, Maryland 20771

Preface

- (a) Objective: The objective of the project is to see if ERTS imagery can be used for detecting regional tectonic structures that in turn are associated with mineralization.
- (b) Scope of Work: A transparency overlay to a mosaic of ERTS imagery is interpreted for regional lineations, geologic formations and other geologic structures. This interpretation is then compared to a similar interpretation compiled from Apollo photography, aeromagnetics, published tectonic maps and others to see if the ERTS imagery interpretation correlates and/or reveals structure not detected by more classical techniques.
- (c) Conclusion: So far, a preliminary analysis of ERTS imagery (scale 1:1,000,000) indicates that major tectonic lineations can be mapped and correlated with other interpretations of such techniques as aeromagnetics, Apollo photography and published geologic maps.
- (d) Summary of recommendations: At this time we have not analyzed in depth the imagery to the degree necessary to make recommendations.

Introduction

The purpose of this report is to discuss the scientific progress to date on our contract in evaluation of the mineral exploration potential of ERTS-1 imagery. The scope of work has been to the phase of a preliminary interpretation of a mosaic lay down of eight frames of MSS, Channel 7, imagery. These prints are positive black and white enlargements to a scale of 1:1,000,000 from the 70mm negatives. The mosaic covers both the test site and also an extensive area surrounding the area of interest which has better enabled us to detect the trend of regional lineations that are discontinuous in some locations.

Geologic Structural Trends

The interpretation was performed on a transparent overlay that in turn can be compared against other maps of the same scale, i.e., aeromagnetics and topography.

The ERTS imagery has three general trends that the lineations fall into. These are: (1) east by northeast, (2) northwest and (3) north-south in direction. Using Schmitt's* structural features classification, these trends, in conjunction with the Geology Map of Arizona, most likely represent the following chief structural elements:

- (1) East by Northeast trend--closely folded schistose and gneissoid rocks that are part of the older Precambrian basement.
- (2) Northwest trend--most likely the Texas Structural Zone.
- (3) North-South trend--Utah-Arizona belt and/or the southern portion of the Basin and Range Province.

A comparison between these trends and those taken from the Residual Aeromagnetic Map of Arizona** shows good agreement and in some localities substantiate the "up" and "down" faulted blocks between the regional lineations.

The major east by northeast lineation shown on the imagery that exists just south of Phoenix is probably the most outstanding example of this comparison in that it is also easily detected on the aeromagnetic map.

* Harrison A. Schmitt, "The Porphyry Copper Deposits in Their Regional Setting," GEOLOGY OF THE PORPHYRY COPPER DEPOSITS, Southwestern North America, Titley and Hicks, The University of Arizona Press, 1968.

** Published by Department of Geosciences, The University of Arizona, Tucson, Arizona, 1970.

One major lineation, made up of many parallel lineations, is noticeable just north of Lake Pleasant (lat. 34° N and long. 112° W) which extends for approximately 100 miles in a northern direction ($N80^{\circ}W$) out of the target area as far north as lat. $35^{\circ}5'N$ and long. $112^{\circ}8'W$. This feature corresponds to a Precambrian schist formation shown on the USGS "Geologic Map of Arizona," scale 1:500,000, 1969. A side-lap stereo examination was undertaken to determine if the individual lineations within the four-mile area are bedding or faults. This attempt was not conclusive at this time, but it is felt that the most likely explanation is that it is bedding, at least in the portion closest to Lake Pleasant.

Although the ERTS MSS resolution is much better than anticipated, a comparison to a color enlargement of an Apollo photo (approximately the same scale) of the Phoenix area reveals that greater detail concerning jointing, drainage patterns, small faults and contrast is possible in the Apollo photography.

Geologic Mapping

The geologic contacts of outcropping formations in the alluvial covered areas on the imagery agrees closely with the published geologic maps of the area. In the vicinity of Newman Peak, approximately 40 miles northwest of Tucson, there are granites and granite gneisses that cannot be subdivided from examining the ERTS imagery, however, to the south (across Highway 84) there is an exposure of andesite or basalt (taken from the geological map) that has a much darker grey level than the granites. However, similar topographic features having the same grey level contrast to the alluvium are not always andesite or basalt formations.

Program for Next Reporting Interval

The work we have planned between now and the next reporting period will be as follows:

- (1) Further analysis of ERTS imagery. We have requested a number of frames in the eastern and southeastern portions of the test area that are cloud-clear coverage since those we now have in our mosaic do have low lying clouds that interfere with the interpretation.
- (2) We have also requested 9" x 9" color composites that will be studied for hue changes that might be indicative of hydrothermal mineralization. These will be enhanced by density slicing false color techniques.

(3) Comparison between the interpretation of the ERTS imagery and the following transparencies on the same scale of 1:1,000,000 will be done:

- (a) Published Structure Map showing faults, anticlines, synclines and dips
- (b) Mineral locations (Copper, Molybdenum, Lead, Zinc)
- (c) Side-looking airborne radar imagery

It is anticipated that these comparisons will confirm, correlate, and hopefully find new areas of mineral interest on the ERTS imagery.

Conclusions

A preliminary analysis of the ERTS imagery indicates that major tectonic lineations can be mapped and correlated with other interpretations of such techniques as aeromagnetism, Apollo photography and published geologic maps.

Recommendations

At this time we have not analyzed in depth the imagery to the degree necessary to make recommendations.